

REMARKS

This is in response to the non-final Official Action currently outstanding with regard to the above-identified application.

At the outset, the Examiner's attention is respectfully directed to the Preliminary Amendment wherein Applicants previously have explained that in the invention claimed in this divisional application the objective lens is designed so that the converged light spot at the mid-point between the first recording layer and the second recording layer of the optical storage medium has a minimum spherical aberration (see specification at page 33, line 18 to page 34, line 3). The two lenses constituting the spherical-aberration correcting mechanism are designed so that with the lens group gap between the first and second lenses equal to k_3 ($\text{dst}(3)$), the light rays having been transmitted through the two lens have a minimum spherical aberration (see specification, page 34, line 9 to page 35, line 3). Therefore, converging the light rays, with the lens group gap of the spherical-aberration correcting mechanism set to k_3 ($\text{dst}(3)$), to the mid-point between the first recording layer and the second recording layer using the objective lens (Figure 13) produces a minimum spherical aberration of the converged light at the mid-point. This effect is explicitly described in the specification at page 38, lines 3-13, wherein it is stated that the spherical aberration can be made minimum also when information is recorded/reproduced on a recording medium with a single recording layer having an optical thickness equivalent to the optical thickness at the mid-point previously discussed.

Another effect of the present invention is to make the amounts of spherical aberration of converged light spots on the first and second recording layers almost equal to each other (see the specification at page 35, lines 6-21).

Claims 11-13 were pending at the time of the issuance of the currently outstanding Official Action.

By the foregoing Amendment, Claims 10, 12 and 13 have been amended. No claims have been canceled, and no claims have been added. Consequently, upon the entry of the foregoing Amendment, Claims 10-13 (as amended) will constitute the claims under active prosecution in this application.

The claims of this application and their current status are set forth above in accordance with the Rules.

More particularly, in the currently outstanding Official Action the Examiner has:

1. Acknowledged Applicants' claim for foreign priority under 35 USC 119(a)-(d) or (f), and has confirmed the receipt of the required copies of the priority documents by the United States Patent and Trademark Office;
2. Indicated that the drawings as filed on May 9, 2000 are accepted subject to a requirement that Figures 17 and 18 thereof be amended so as to contain a legend such as -- PRIOR ART --;
3. Provided Applicants with a copy of a Notice of References cited (Form PTO-892) along with copies of each of the newly cited references;
4. Provided Applicants with a copy of the Form PTO-1449 that accompanied their Information Disclosure Statement in the above-identified application duly signed, dated and initialed by the Examiner to confirm his consideration of the art listed therein;

5. Objected to the specification on the basis that the Abstract of the disclosure exceeds 150 words;
6. Rejected the Claim 12 and 13 under 35 USC 112, first paragraph, on the bases that Claim 12 is unclear as to what the relationship dst (3) is intended to represent (the Examiner refusing to treat Claim 12 on the merits for this reason); and that Claim 13 contains a broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation thereby rendering the claim indefinite since the metes and bounds of the invention are not clearly set forth;
7. Rejected Claims 10, 11 and 13 under 35 USC 103(a) as being unpatentable over the McDonald et al (U.S. Patent 6,071,549) reference.

Further comment in these Remarks regarding items 1, 3 and 4 are not deemed to be required.

With respect to item 2, Applicants by the foregoing Request for Drawing Change Approval and their concurrent submission of new formal drawings have complied with the Examiner's requirement that Figures 17 and 18 be amended so as to contain a legend such as -- PRIOR ART --. Applicants respectfully submit that this action removes the bases for the Examiner's objections to the drawings. A decision so holding in response to this communication is respectfully requested.

With respect to item 5, Applicants by the foregoing amendment have shortened the length of the Abstract of the Disclosure as required by the Examiner. Accordingly, the basis for the Examiner's objection to the specification has been removed. Accordingly, a decision withdrawing the Examiner's objection to the specification in light of the foregoing Amendment in response to this communication is respectfully requested.

With respect to item 6, the Examiner suggests that Claim 12 is so unclear that it cannot be examined on the merits and that Claim 13 contains a broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation thereby rendering those claims indefinite since the metes and bounds of the inventions are not clearly set forth.

The Examiner's comments concerning Claim 12 are respectfully not well taken. The claim on its face states that "...each said lens group being constituted by at least one lens and arranged so that rays emitted from the spherical-aberration correcting mechanism have a minimum spherical aberration when ... a lens group gap represented by $dst(3)$ satisfies the relationship; $dst(3) = [DIS(1) + DIS(N)] / 2$ " (Note: the unclosed parentheses in the last quoted equation has been replaced in the foregoing amendment with an appropriately closed set of brackets.) Accordingly, Applicants respectfully submit that the claim is clear and definite as to its meaning, namely, the lens group gap when rays emitted by the spherical aberration correcting mechanism have a minimum aberration is represented by $dst(3)$; and $dst(3)$ is defined in terms of $DIS(1)$ and $DIS(N)$.

Nevertheless, since the Examiner has indicated some confusion on this issue, Applicants have the following additional comments that are respectfully submitted to show that the meaning of Claim 12 unambiguously apparent when read in light of its accompanying specification. Specifically, Claim 12 relates to the spherical-aberration correcting mechanism that is shown in Figures 13 through 15 of the present application. More particularly, the invention of Claim 12 has such a characteristic that light rays emitted from the spherical-aberration correcting mechanism have a minimum spherical aberration (ideally, a plane wave) when the two lenses included in the spherical-aberration correcting mechanism have the gap $dst(3)$ therebetween (Fig. 13), and the converged light spot formed at the mid-point of the two recording layers of the recording medium by the objective lens also has a minimum spherical-aberration.

Accordingly, Claim 12 has the wording: "light rays emitted from the spherical-aberration correcting mechanism have a minimum spherical aberration", which corresponds to the wording "light rays emitted from the spherical-aberration correcting mechanism have a minimum spherical-aberration" of Claim 10 on which Claim 12 is dependent.

Further, the lens group gap $dst(3)$ is defined by the mathematical formula:
 $dst(3) = [DIS(1) + DIS(N)] / 2$, using the gap $DIS(1)$ at which the spherical-aberration of the first recording layer has a minimum spherical-aberration, and the gap $DIS(N)$ at which the spherical-aberration of the Nth recording layer has a minimum spherical-aberration.

Further, the foregoing mathematical formula as set forth in claim 12 can be even more clearly understood by referring to Figures 7(a) through 7(c) and to the Example recited in the explanation of those figures in the text of the specification of the present application. As can be seen from this analysis, in Figure 7(b), the lens group gap $dst(3)$ is approximately 1.51 mm, the lens group gap $DIS(1)$ is approximately 1.56 mm, and the lens group gap $DIS(N)$ is approximately 1.46 mm. These values substantially satisfy the foregoing formula. Hence, $dst(3)$ is clearly shown to be defined by the formula claimed in Claim 12.

In addition, the invention of Claim 12 has the same scope as the structure described in its associated specification.

Finally, it will be understood that the invention of Claim 12 comprises the objective lens described in Claim 10 and the spherical-aberration correcting mechanism that satisfies the above-quoted formula. This structure provides such an effect that, as shown in Figure 7(a), the spherical-aberration correcting mechanism at the mid-point (the portion having an optical thickness of 100 μm) of the two recording layers of the recording medium has a minimum spherical-aberration, and the other recording layers (with optical thicknesses of 80 μm and of 120 μm) have an identical and relatively small spherical-aberration.

Therefore, Applicants respectfully submit that not only is Claim 12 on its face clear and definite as to the definition of the term “dst (3)”, but also that the meaning of that term when read in light of the accompanying specification is unambiguous and certainly appropriate under the terms of 35 USC 112. Consequently, Applicants respectfully submit that the Examiner’s refusal to examine Claim 12 on its substantive merits was in error; that the Examiner’s rejection of Claim 12 under 35 USC 112, second paragraph, should be withdrawn; and the Claim 12 as hereinabove amended to correct a minor typographical error should be reconsidered and allowed. A decision so holding in response to this communication is respectfully requested.

With respect to claim 13, Applicants respectfully submit that as originally filed in was abundantly clear that claim 10 does not encompass the situation wherein there is only one recording/reproducing layer in the recording medium, and that claim 13 does not encompass the situation wherein the recording medium has more than one recording/reproducing layer.

Specifically, claim 13, which is dependent upon claim 10, and thus further limits claim 10, as originally filed clearly and definitely sets forth the metes and bounds of the protection desired. In other words, Claim 10 established the metes and bounds of the protection desired when the recording/reproducing medium has more than 1 recording/reproducing layer, and claim 13 established the metes and bounds of protection desired when the recording/reproducing medium has only one layer. The ranges claimed in each claim do not overlap one another (i.e., a range of 2 or more does not overlap a range limited to one) so there can be no confusion of the type suggested by the Examiner.

Nevertheless, in the interest of furthering the present prosecution, Applicants now have amended claims 10 and 13 so as to clarify the fact that the recording/reproducing medium has “at least one recording layer” and that the limitations of claim 10 apply when the recording layer has 2 or more recording layers and the limitations of claim 13 apply when the recording medium has only one 1 recording layer.

More particularly, the characterization of the structure of the medium as having “at least one layer” is followed in claims 10 and 13 by two separate range designations which constitute separately stated limitations applicable to recording/reproducing to/from a medium having two (2) or more layers, on the one hand, and limitations applicable to recording/reproducing to/from a medium having a single layer, on the other hand. Significantly, therefore, the limitations applicable to mediums having two or more layers are stated totally separately from the limitations applicable to mediums having a single layer.

Applicants respectfully submit that none of the present claims ***falls within the precedent relied upon by the Examiner to the effect that the same claim cannot contain a broad limitation applicable to a broad range and a narrow limitation applicable to a narrow range within the previously claimed range covered by the broad limitation***. Stated slightly differently, there is no question, or implication of a possibility in the present circumstances concerning error or confusion as to whether or not the limitations attributed to a medium with a single layer are simply exemplary of the limitations attributable to mediums having two or more layers. The limitations attributable to each separately defined group (specified number of layers) are stated separately, and no one of ordinary skill in the art at the time the invention was made reasonably could be confused concerning which of the claimed limitations applied to which group, or whether one set of limitations was only exemplary of the limitations of the other group.

Consequently, Applicants respectfully submit that this situation is inapposite to the situation contemplated by the case law referred to by the Examiner in which two different sets of limitations might render the claims indefinite by raising a question or doubt as to whether a feature introduced by the language in issue is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. The amendments to the wording of claims 10 and 13 above clarify the foregoing facts. Accordingly a decision withdrawing the outstanding rejection of claim 13 under 35 USC 112 and granting substantive consideration thereto is respectfully requested in response to this communication.

With respect to the Examiner's substantive rejections as referred to in item 7 above, Applicants have the following comments.

The present invention uses an objective lens designed so that “the converged light spot at the mid-position between the first recording layer and the second recording layer in the optical recording medium has a minimum spherical-aberration” (see original English language specification at page 33, line 18 to page 34, line 3), and also uses two lenses (first and second lenses) to constitute the spherical-aberration correcting mechanism. This structure is designed so that “when the lens group gap between the first lens and the second lens is set to k_3 (dst (3)), the spherical-aberration of light rays transmitted through those two lenses is minimized (see specification at page 34, line 9 to page 35 line 3). With this structure, the light rays transmitted through the two lenses having the gap k_3 (dst (3)) therebetween are converged (see Figure 13) at the mid-position of the first recording layer and the second recording layer by the objective lens, thus **minimizing the spherical-aberration of the converged light spot at the mid-position**. This effect can be clearly seen in the description: “... even in the case when information is recorded or reproduced on or from a recording medium having only a single recording layer having an equivalent optical thickness as that of the mid-point, it is possible to minimize the spherical aberration.” (see specification page 35, lines 16 to 21).

In contrast to the foregoing, ***McDonald et al. (US 6,091,549)*** discloses an apparatus and a method for correcting spherical-aberration with a smaller number of optical components than were required for that purpose in the prior art. Further, the McDonald reference includes a teaching concerning adjusting the gap between two lenses when the position (depth) of the focal point within the medium is changed, and a teaching concerning the design of the two lenses so as to have specific shapes such that the foregoing adjustment with the smaller number of optical components is possible.

It is to be noted, however, that teachings concerning the design the two lenses to have specific shapes does not provide the McDonald reference with any teaching, disclosure or suggestion of minimizing the spherical-aberration of the converged light spot at the mid-position between the first recording layer and the second recording layer in the optical medium. Applicants respectfully submit that this shows that the shapes of the lenses in the McDonald reference are designed not to decide the position (depth) of the recording medium where the spherical-aberration of the converged light spot is minimized, but rather mainly to achieve the reduced number of components utilized in the disclosed device relative to the prior art thereto.

The Examiner apparently has construed the present invention as merely being a mechanism for correcting spherical-aberration by changing the gap between the respective lenses of a lens grouping. To this extent, the McDonald reference discloses an arrangement in which the spherical-aberration generated in the recording layer of the recording medium is corrected by changing the gap between two lenses constituting the objective lens. Hence, to this extent, the McDonald reference is similar to the present invention. The present invention, however, is more complex than the construction the Examiner apparently has given to it.

Thus, it will be understood that the scope of the McDonald reference is different from the present invention. In particular, the following three teachings of the present invention are not taught, disclosed or suggested by the McDonald reference:

- 1) The object lens is designed so that the converged light spot at the mid-position between two recording layers has a minimum spherical-aberration;
- 2) Apart from the objective lens, the spherical-aberration correcting mechanism is provided to correct the spherical-aberration; and

- 3) When light rays emitted from the spherical-aberration correcting mechanism toward the objective lens have a minimum spherical-aberration, the converged light spot formed at the mid-point of the two recording layers of the recording medium by the objective lens also has a minimum spherical-aberration.

Therefore, the McDonald reference does teach that “the spherical-aberration generated in the recording layer of the recording medium is corrected by changing the gap between two lenses constituting the objective lens”. In other words, McDonald et al clearly reduces spherical-aberration in comparison with the case where no correction is performed at all. However, unlike the present invention, the McDonald et al reference does not teach, disclose or suggest that a further reduction of spherical-aberration is corrected.

For example, in the specification of the present application, Figure 6(a) shows a spherical aberration (not in accordance with the present invention) in the case where the spherical-aberration correcting mechanism is combined with an objective lens that minimizes the spherical-aberration of the light spot converged on the first recording layer, i.e., one of the two recording layers. In that structure, the spherical-aberration after the correction (dotted line) is smaller than that before correction (solid line). Nevertheless, it will be seen that the light spot converged on the second recording layer (optical thickness = 120 μm) has a spherical-aberration of approximately 0.05λ .

On the other hand, in the objective lens according to the present invention, which is shown in Figure 7(a), the spherical-aberrations of the light spot converged on the first and second recording layers is reduced to 0.02λ or less. In other words, the present invention uses the objective lens so that the spherical-aberrations of the converged light spot is minimized with respect to a certain thickness of an optical transmissive body. McDonald et al have no teaching, disclosure or suggestion of such a characteristic of the objective lens. Consequently, it is abundantly clear that the technical scope of the present invention is distinct from the technical scope of the McDonald et al reference.

Still further, the McDonald et al reference describes at the third column, lines 16-20 that "a noncolimated laser beam may also be used to converge light on the middle layer 22B". Hence, the McDonald reference does not restrict the spherical-aberrations of the light rays incident on the objective lens – a definitive indication the the McDonald et al reference does not teach, disclose or suggest the concept described under the numeral 3 above.

Therefore, in view of the foregoing amendment and remarks, Applicant respectfully submits that Claims 10-13 of this application are now in condition for allowance. Reconsideration and a decision so holding in response to this communication are respectfully requested.

Applicants also believe that additional fees beyond those submitted herewith are not required in connection with the consideration of this response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. **04-1105**, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

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